Space Weather Technical Forecast

Issued on Wednesday, 27 April 2022 at 01:28 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: M-class flares (R1/R2 Radio Blackouts) likely, with a slight chance of X-class flares (R3 Radio Blackouts).

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Low, with a number of C-class flares observed. There are eight regions on the visible disc, with AR2993 (Dki/Beta) and AR2994 (Eki/Beta-Gamma) the most active of these in the northwestern quadrant. The remaining regions, three in the northern hemisphere and three in the southeastern quadrant, are all simple beta regions, or benign alpha spots. No Earth-directed CMEs have been observed on available imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as observed at L1, has averaged around 400km/s as the high speed stream from coronal hole 77 continues to wane. Density has been below average throughout. Overall magnetic field strength was weak, with the north-south component, Bz, also varying weakly. The phi angle has been predominantly positive throughout. Geomagnetic activity was Quiet.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) was at background levels throughout. The high energy electron flux (greater than 2MeV) has been at background to moderate levels throughout. The associated 24 hour fluence was below the Active (1e8 integrated pfu) level on a very slight rising trend, with 1.44e7 integrated pfu recorded at 26/0000 UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is expected to be Low, with a risk of Moderate activity and a very slight risk of High activity.

Solar Wind / Geomagnetic Activity: No Earth directed CMEs are currently forecast. Solar winds are expected to be around or close to ambient levels through 27 April and much of 28 April. Speeds are then forecast to reach 500-550km/s later in 28 April due to the onset of the high speed stream form coronal hole 78. Geomagnetic activity is forecast to be mainly Quiet on 27 and 28 April, but could reach Active to G1/Minor storms on 28 April and into 29 April due to the expected onset of the high speed stream. Unsettled intervals, with a risk of Active are then likely on 29 and 30 April.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is at background levels, and is most likely to remain so through the next four days, although two significant regions are now transiting the northwest quadrant and together bring a slight chance of solar radiation storms reaching Earth. The high energy electron flux (greater than 2MeV) is expected to be at mainly background to moderate levels, but with a trend towards the high (1e3 pfu) threshold possible through 29 and 30 April. Electron fluence is expected to remain below the Active (1e8 integrated pfu) threshold but with a rising trend later in the period.

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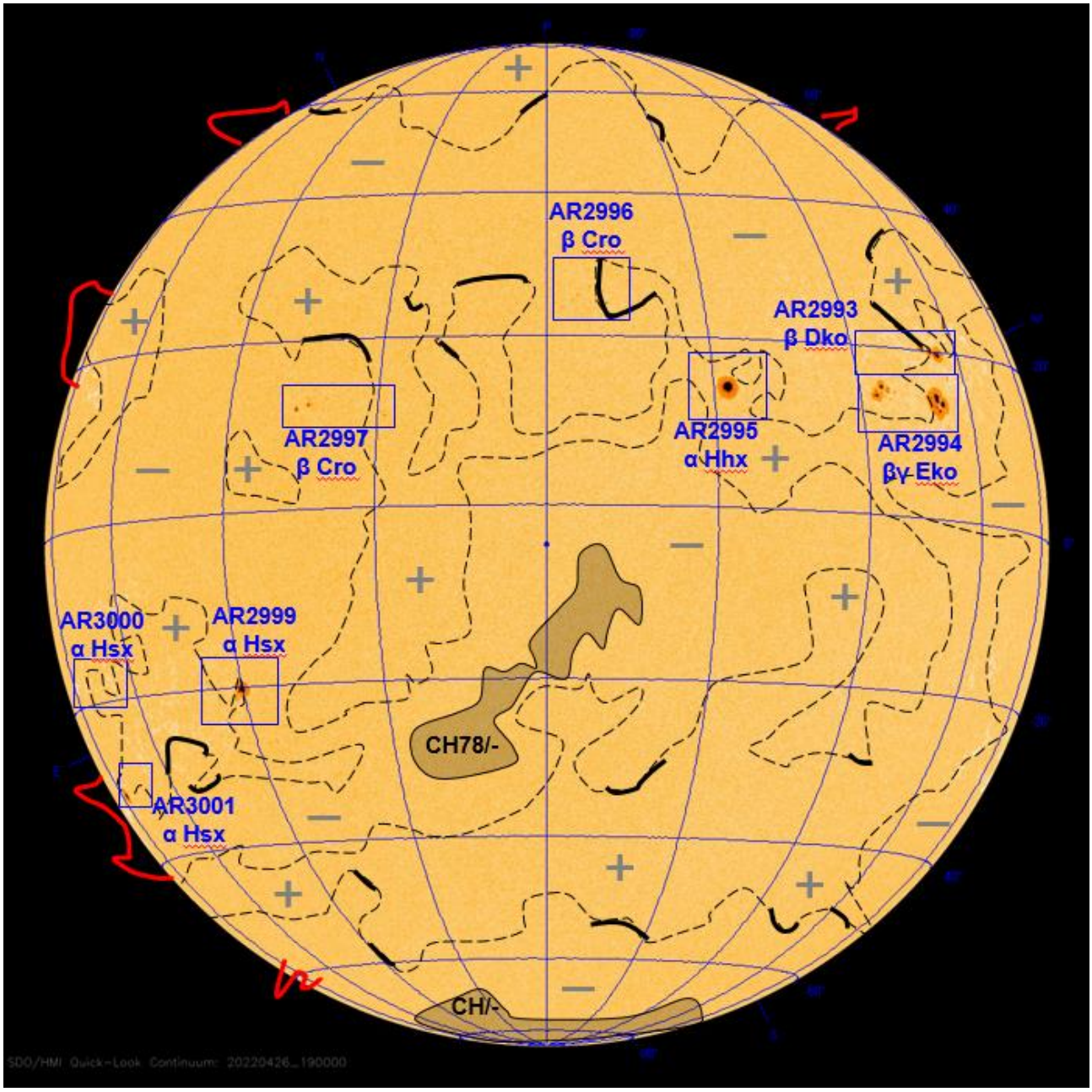
Figure 1. Solar Analysis Valid 26/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs forecast for the next four days.

Solar wind conditions are close to background due to the fitful decline in the high speed stream from coronal hole 77. Generally background conditions then are likely through day 1 and much of day 2 (27 and 28 April). A high speed stream from coronal hole 78 is then forecast to connect with Earth, either late on 28 or early on 29 April. This is supported by observations from STEREO A, which is starting showing signs of a CIR (co-rotating interaction region) early on 26 April. As STEREO A is 2.5 days ahead of Earth, this would suggest an arrival late on 28 April. A high speed stream of 500-550km/s is then forecast, based on persistence, as this is a recurrent feature.

Geomagnetic activity is expected to be mainly Quiet on day 1 and much of day 2. Active or G1/Minor Storm intervals are then possible later on day 2 due to the onset of the high speed stream from coronal hole 78. Unsettled intervals with a slight chance of Active are then possible on days 3 and 4.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	20	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

None expected

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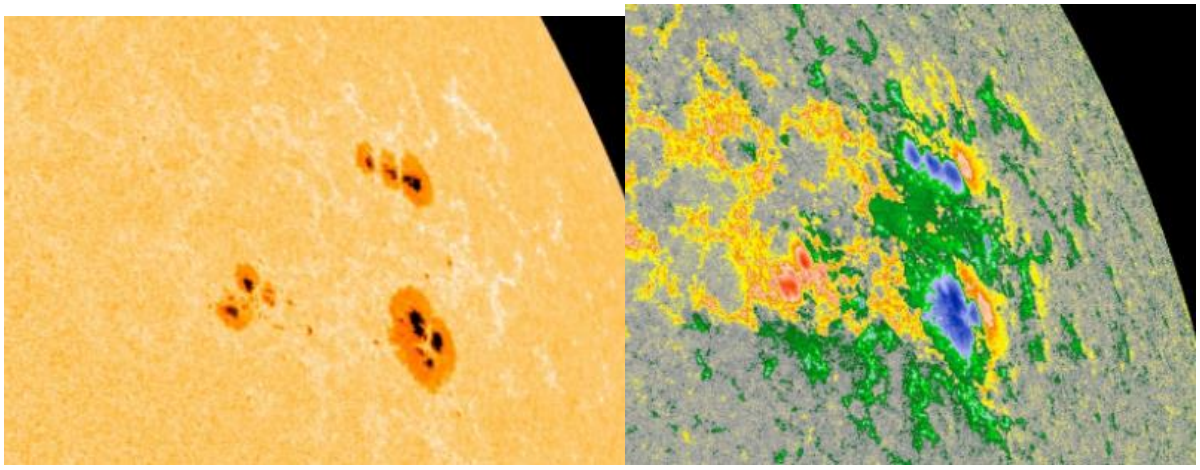
Radio Blackouts - X-Ray Flares:
Solar activity is expected to be Low to Moderate over the next four days, with a very slight chance of High activity.

2993 (Dko/Beta) and 2994 (Eko/Beta-Gamma) are the most dominant, spots, both in the northwest quadrant. There is some slow evolution in both regions but together they present the bulk of the flare risk for the next 3 to 4 days as they rotate towards the western limb. Three further regions in the northern hemisphere appear to weak or benign, or in decline and fading to plage. Three regions in the southeast are all simple alpha regions. A number of filaments are being monitored for potential eruptions, especially in the western hemisphere which could result in an Earth-directed CME.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	50	50	50	50
Very Active	R3 to R5 X Class	No	10	10	10	10

Figure 2: SDO HIM Intensitygram and magnetogram imagery of regions 2993 and 2994 in the northwest quadrant at 26/2345UTC.



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as measured by GOES-16 at GEO is at Background levels, and is most likely to remain so through the next four days. However, AR2993 and AR2994 both bring the possibility of isolated high M-class to low X-class flares. There is a slight chance that solar radiation storms from any such events may be observed at Earth as they rotate across the northwestern quadrant.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	10	10	10
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2MeV) is expected to vary between background and moderate levels on days 1 and much of day 2 in a benign solar wind environment. The CIR ahead of the next high speed stream is then likely to compress the radiation belts and redistribute electrons, leading to a drop in the flux. A recovery in counts is them expected through days 3 and 4, with the electron flux increasingly likely to reach the high level (1e3 pfu) on diurnal highs by day 4.

Electron fluence values are likely to remain below the Active threshold (1e8 integrated pfu) through the period, but with a rising trend on days 3 and 4.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	10	20
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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